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## Nature Inspired Clothing Design Based on Biomimicry

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**Abstract:** Sources of inspiration and its personal interpretation, visually and technically, play an important role in the clothing design process and increasing creativity. Even though the use of sources of inspiration is entirely pragmatic, it is possible to identify different types of sources of inspiration, performing different roles. Designers can be inspired of anything visual and tactile for designing a garment. The major types of idea sources for clothing designers are fabrics, historical and ethnic costumes, artifacts and previous products, architecture, natural objects and phenomena which play an important role in clothing design process. In this research, different types of inspiration sources in clothing design are identified with a special focus on nature as an important one. Nature has been a grateful source for inspiration in different areas of science and art. The new field which is named biomimicry is an applied science that derives inspiration for solutions to human problems through the study of natural designs, systems and processes. The purpose of this research is identifying different layers of biomimicry which are used in clothing design process. Finally, considering different factors in clothing design as well as biomimicry principles, three levels of biomimicry in clothing design is introduced. Clothing design process can be affected of biomimicry in form, function and material. The level of form is categorized to five sub levels which are style and outlook, color, texture, proportion and pattern. Each of these levels can be considered individually in design process or used simultaneously to create a different clothing outlook. Finally, two major approaches are introduced in clothing design based on biomimicry, which are iconography and emotional design. Each of these approaches has special and different methodology which results in different clothing appearance too.

**Keywords:** source of inspiration, clothing design, nature, biomimicry

### Introduction

Among different human needs is the need for clothes that has been met by different kinds of clothing and coatings over time. In today's world, clothes have passed their mere concept of covering that prevailed in the past among people and communities of first periods, and have changed to a visual tool introducing people in terms of emotion, culture, economy, geography, and history. As a result, clothing design is now one of the leading branches in the field of design, which has become an independent industry (Aspers, 2010: 190) and the related investigations expand in all directions. On the other hand, clothing design is closely connected with fashion that due to its pace of change, needs to continuously collect information from various sources and before working on any new sets. Clothing design, has shared aspects with other design features because of its aesthetic and functional aspects. However, the process of clothing design, which is based on fashion creative trend, is more complex and problematic than the process of product design due to its need for interaction between the design elements and principles, material properties, and adaptation and modification of design inspiration. (Mete, 2006: 279). In the process of clothing design, it is highly regarded to attend to the sources of inspiration in the early stages and so it has an important role at the beginning stages of the design process, (Eckert, 1997: 360) as design activity does not happen in a vacuum and designers are affected by everything they face. Designers gather some information before starting work, which consists mainly of current and future fashion trends and try to predict what their customers will want in the foreseeable future. Thus, designers must always have their eyes open to absorb visual ideas, combine them, and translate them into clothes which are favored by the customers (Frings, 2007: 75). Therefore, utilizing a variety of topics as sources of inspiration and idea finding is highly regarded in clothing design that can be a topic for research. Sources of inspiration play an important role in design thinking, as definitions of context, triggers for idea generation, and as anchors for structuring designers' mental representations of designs. (Eckert & Stacey, 2000: 525). In addition, sources of inspiration are effective in creating interaction between designers, clients, and manufacturers and by creating a common and understandable relationship, they create a stronger emotional expression (Eckert, 1997; 361). However, finding sources of inspiration is usually costly and time-consuming.

The term sources of inspiration refers for "all conscious uses of previous designs and other objects and images in a design process which helps the designers to use the knowledge of similar conditions and problems in their work" (Eckert et al., 2000; 2). This kind of thinking and reasoning, called analogical reasoning, plays an important role in some fields such as architecture. People's responses to the sources of inspiration as visual stimuli are different. For example, a graphic student shows a better response to two-dimensional shapes and an industrial design student reacts to three-dimensional forms

(Goldschmidt, 2001; 201). Sources of inspiration are divided into two categories of between-domain and within-domain based on the difference and the distance from the subject of design (Goldschmidt, 2001; 203). Within-domain sources refer to cases related and similar to the original design subject, and between-domain resources are the examples that exist in a distinct and different domain compared to the main design subject (Chen, Peng, 2015, 1). During the process of fashion design, sources of inspiration, which are of the most important creative design elements, stimulate the designer and begets ideas on his mind. Successful designers detect a unique source of inspiration and turn them into attractive modes of addressing. Designers set everything as themes of inspiration and anything visually attractive, such as examples of architectural samples, styles, and historical clothing, art, nature, environment, technology (Kotb, 2014, 1) and even a plate of baked beans (Eckert, 1997, 361) can be inspiring to them. The present descriptive-analytical study identifies the sources of inspirations that are concerned in clothing design, emphasizes the special status of nature and seeks to identify structural relationship between clothing design and biomimicry. For this purpose, we first identify all possible sources of inspiration in clothing design. In the midst, nature that has historically been considered in all areas of art and science has a special place. Nature inspiration as a scientific branch is expressed with multiple titles, and currently biomimicry, the common and frequently used word is raised by Janin Benyus and offers different levels of inspiration from nature and a specific method for design based on biomimicry. In the following, it is introduced biomimicry theory and matches its various levels with clothing design. Finally, some samples done based on two different approaches in clothing design will be presented, which are the research achievements of this study.

### **Various sources of inspiration in clothing design:**

There is no limit in the use of subjects as sources of inspiration and any incident in art and design can inspire artists and designers. All issues that have a strong visual and tactile aspect are used as a source of inspiration. Museums, art exhibitions, events in the global arena, historic samples of the past time, theater, music, dance, and so on are of the examples used by artists and designers. Therefore, the search for finding new sources of inspiration and ideas needs to focus on different art objects and books, visit different places, and pay attention to the behavior of people in all regions and places. Although designers typically seek to find new and exciting samples, they never lose sight of the past and always redesign and offer old patterns through new ways (Stone, 2001, 82). However, at the same time, sources of inspiration are often connected to the social "spirit of the times" (Mete, 2006; 283) to find acceptance in the eyes of its clients and users. Generally, in fashion and design industry, two fundamental approaches are effective in the design process upon which different sources of inspiration are defined:

1. Materials and more specifically fabric can significantly affect clothing design process (Ibid). The principal material forming the clothes is fabric. Therefore the characteristics of this material are heavily involved in the design of clothes and even have a special place as an independent source of inspiration for designers. Material, color, texture, and various designs of non-stitched fabric affect the clothing design process and designers works (Figure 1). Visual and tactile characteristics of materials, -for example a fabric with an attractive design or different textures - serve as the design foundation for a collection (Burns et al., 2011; 32). While some designers use historic items or traditional clothes, others study new special fabrics with innovative textures and designs in the exhibitions and weavers to initiate their own new projects. In these samples, new forms and styles of clothing based on newly developed and advanced materials and technical competencies of the materials, and also according to the talent and creativity of designers, turn into a new form and functionality in clothes. For example, the invention and development of elastane fabric such as lycra led the designers to design clothes taking the shape of the body's organs<sup>1</sup> (Mete, 2006; 283). In addition, in some other cases, the fabric suitable to the design is selected and used after designing the clothes.

Among clothing designers inspired by the qualities and characteristics of fabrics is Christian Dior (Figure 2). He argues, "Many a dress of mine is born of the fabric alone" (Melchior & Svensson, 2014; 149). Among other examples in which one can see the effect of material in clothes, are the samples presented at spring/summer 2006 exhibition designed by Phoebe Philo (Mete, 2006; 287). However, it should be noted that although the fabrics are of the most important sources of inspiration for designers, mainstream clothing designers are limited to the fabrics that are currently available in their price range.

2. Conceptual clothing design process, such as several themes originated from the universe of arts, nature or products. (Mete, 2006; 283) Designers normally consider an issue, nurture it, and translate it into a creative and impeccable idea. Issues such as objects and old products, artifacts, natural objects and phenomena are generally considered the major types of idea sources. In the following, we introduce a variety of sources of inspiration used by designers in clothing design.

#### **2.1 Garments and other products:**

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<sup>1</sup> Lycra is of polyurethane fiber types. These fibers have somewhat properties of rubber. Thus, their length increases more than one hundred percent due while stretching and after releasing immediately return to its original length. For the first time, it was made in 1954 by the American company (Du Pont) and was offered to the market under Lycra brand name. Lycra fibers is often used in making belts, bras, corsets, stockings, wristbands, shin guards and gloves and are used for medical and sport purposes. Shin part of normal socks is of lycra fibers.

Designing of any product, the first focus is on the similar products (within-domain sources). Thus, a variety of clothing available in the market as well as past examples of historical, traditional, ethnic, and streetwear costumes are the reference for taking ideas by the designers (Mete, 2006, 283). By participating in various events, visiting the shops and shopping malls, watching television programs of renowned artists, designers understand current approaches in fashion design, identify seasonal features, and pay attention to the quality of clothes designed by competitors in the market. Then, designers create clothes based on the new ideas formed in their minds from those searches.

## 2.2. Ethnic and historical clothing:

Among the most widely used and most powerful archives of the designers are historical, traditional, and local costumes (Jennings, 2011; 11). These clothes often have very rich visual features due to their deep bond with folk roots and have a significant difference with common urban examples. Thus, the designers have considerable interest in referring to these examples. This category is examined in two parts: 1. Historical clothing that was common in certain time interval, such as clothing of the kings in their reign period, and 2. Ethnic costumes that form the traditional clothes of a nation, people, or a particular region like clothes of nomads or Kurdish tribes. Museums, historical films and books are a good source for obtaining information in this regard.

Designers' approach in designing clothes based on historical ones is divided in two parts: 1. using the overall forms of clothes and 2. combining elements and details of clothing (for example the sleeve or collar cut) (Mete, 2006; 284). Among the examples of this approach are the clothes by John Galliano clothing for spring / summer 2005 exhibition in which historical character's cloth, named Jose'phine de Beauharnais who belonged to Napoleon time, was the source of inspiration (Figure 3).



Figure 1. Designer: Alexander Mc-Queen. The use of shiny surfaces and natural forming of fabric to create a visual impact.  
Source: faybruno.blogspot.com



Figure 2: Women's night clothing. Designer: Christian Dior, the use of two materials with different characteristics in cloth.  
Source: imgkid.com



Figure 3: left: John Galliano's clothing design based on overall form and especially sleeve and collar details is inspired from historic examples

Source: pinterest.com, dianliwenmi.com

Right: Jose'phine de Beauharnais in the clothes that was John Galliano's source of inspiration- Source : wikipedia.org

In addition to historical costumes, traditional and local costumes of different cultures and nations have provided another richest potential form collection for clothing designers. Global environment and persuasion towards local and indigenous cultures have triggered this interest and the process. Hence, designers have been eager towards ethnic groups and cultures that have more unfamiliar and unique styles of clothing and fabrics. Different cultures such as Asia, Russia, Africa, China, Spain, Persia, and Austria are of the examples that have been used by designers. As an example, Christian Dior was inspired from Indian clothing in designing a dress.

### Objects and artifacts

In addition to current or past clothes of different periods which are used as within-domain resources of inspiration for designing clothes, various objects and artifacts are also considered as inspiring stimulus by designers, such as architecture, furniture, electronics, painting, and even food (Kotb, 2014; 1). Liliya Hudyakova, a Russian designer and artist, has set some monuments the center of designing her clothes in her recent collection of designs.



Figure 4: Designer: Liliya Hudyakova. Clothing inspired from the texture, color and pattern in architecture. Source: [instagram.com/l\\_i\\_l\\_l\\_i\\_u\\_m](https://www.instagram.com/l_i_l_l_i_u_m)



Figure 5: Left: Designer: Elsa Schiaparelli. The use of Salvador Dali's lobster telephone's picture on cloth. Right: Salvador Dali's lobster telephone. Source: [merylesecrest.com](https://www.merylesecrest.com)

Façade of some important buildings of the world or the whole structure of a building is manifested in the clothing designed by these artists (Figure 4). Having a unique designer personality, leads the designers to look for ways that separate their works from that of others. Another notable example in this regard is the clothing in which Elsa Schiaparelli has used Salvador Dali's famous lobster telephone's picture. (Figure 5)

### Nature

The last archive used by clothe designers in this study is nature. Nature has been a source of inspiration in different branches of engineering and materials science as well as art. Among the stimulus to create variety in clothes, are the rich and endless visual resources of nature. Designers have used different aspects of nature like colors (sunset), texture (tree trunk), and form (flowers). Among the masterpieces of this approach are clothes designed by Liliya Hudyakova mentioned in the previous section. With her unparalleled creativity, she has created beautiful costumes inspired from various scenes in nature (Figure 6)



Figure 6. Designer: Liliya Hudyakova, samples of clothing inspired from nature in the texture, color and form  
Source: /instagram.com/l\_i\_l\_l\_u\_m

### Biomimicry and inspiration from nature:

Nature has always been considered in different subjects and in different areas of engineering, technology, materials, architecture, design, and so on, and it has been the source of inspiration for scientists and designers. Over time, this area has been improved and it was for the first time in 1960 that the word Bionic was introduced by Jack Steel meaning “copying and getting an idea from the nature” (Lepora et. Al, 2013; 3). Nature is used in many specialized areas and many words are using to define it in each area.<sup>2</sup> Biomimicry term was firstly proposed in early 1982 by the scientist and author "Janine Benyus" and became common in 1997 in his book "Biomimicry: Innovation Inspired by Nature" (Saad El Ahmar, 2011, 5). In this book, he defines biomimicry as "a new science that studies natural models in order to solve human problems through inspiration or imitation of nature" (Benyus, 2002; 1). Word Biomimicry is composed of "Bio" meaning life (which has a Greek origin) and "mimic" which means imitation (Pauw et al., 2010; 7). Benyus states that biomimicry is inclusive than bionic, as in bionic it is only discussed about developing engineering technologies by mimicking the natural and bio mechanism (Benyus, 2002; 3). In comparison, Biomimicry includes a wide range of strategies and approaches used in many areas such as material science, product design, innovation, systems design, architecture, mechanics, and communication that is called with different titles like biomimetic and design inspired from nature (Bhushan, 2009; 1447). Due to the significant differences in biological structures compared with engineering samples, numerous studies are being conducted to find appropriate methods for transferring knowledge from the field of biology to engineering (Sarkar et al., 2008; 2).

### Biomimicry in designing process:

Biomimicry as one of the methods used in the designing process, can be used in different parts of the design process. Biomimicry based on the Biomimicry Institute's statement, can be involved in three stages in design process:

1) The stages of defining design problem, 2) idea generation (revising engineering solutions based on nature), and 3) evaluation (using natural principles and criteria for achieving sustainable products) (Biomimicry Guild; 2010). Biomimicry in design process is also discussed in two main approaches: problem-based approach and solution-based approach.

Problem-based approach is named with other titles as well,<sup>3</sup> begins with the discovery of the problem and understanding the need in users and people's lives. While seeking solutions to these problems, designers consult biologists who are familiar with natural samples (Saad El Ahmar, 2011, 9). This approach is planned in six steps: 1) Defining and identifying problems, 2) finding natural samples, 3) simplifying and analysis of natural models, 4) extraction and integration of the principles and solutions, 5) testing, analyzing, and getting feedback, and 6) the use of the extracted principles in designing (Helms et. Al., 2009; 610).

<sup>2</sup> Biomaterials, biomechanics, Bio design

<sup>3</sup> Design looking to biology, Top-down Approach, Problem-Driven Biologically Inspired Design

Among the most famous samples done in this way is Daimler Chrysler bionic car, in which to design a larger car with smaller wheels, an aerodynamic fish (Box fish) was elected (Figure 7). Structure, frame and chassis were designed based on the quality of growth of trees and computer calculation of it to minimize stress points (Vincent et al., 2006). Designed car is more fuel-efficient due to having an aerodynamic body. Moreover, consumables are reduced to a minimum due to using the structure of tree growth.



Figure 7: Chrysler bionic car designed by inspiration from boxfish. Source: sites.psu.edu

In solution-based approach, expressed by various other titles<sup>4</sup>, instead of beginning with a design problem and moving towards nature finding a solution, it is resorted to discoveries and biology knowledge (Saad El Ahmar, 2011, 12). New researches from nature explored by specialist and then used designing and delivering innovative new products. This approach also is performed through six steps: 1) Identifying biological solution, 2) analyzing mechanism, form, and anatomy of natural samples, 3) extraction of principles and guidelines, 4) identifying and describing the problem, 5) studying technical considerations, and 6) the use and implementation of the principles in designing (Helms et. Al., 2009; 616). The famous example of this approach is the use of Lotus effect<sup>5</sup> in creating superhydrophobic surfaces through which, many innovations happened in textile engineering. Inspiration from nature is possible at different levels and experts in different field have offered numerous divisions (Yurtkuran, et al., 2013, Maglic, 2012, Zari, 2007). From biomimicry point of view, inspiration from nature happens at three levels: form and function<sup>6</sup>, process, and ecosystem (Benyus, 2002, 10). In the first level, form or mechanism in nature is used: like adhesive designed inspired from Velcro<sup>7</sup> or inspiration from owls feather edges that cause silent flight of the owl. According to Benyus, this level of imitation is the most basic type that does not necessarily cause long lasting results. The second layer is inspired by nature's processes and is far more thorough and deeper than the first level. For example, being inspired from the heating and cooling system in termite nests is done at this level. Finally, the last level considers the entire ecosystem of nature, and thus studies the relevance and impact of natural components processes and uses the entire ecosystem of nature. Benyus believes that more sustainable results, at this level of imitation, can be achieved.

Based on this model, clothing design can occur at these three levels too, but the samples are done so far, mostly relate to form and function level. Reconstruction of natural principles at process and ecosystem levels can even transform industrial production of fabric, clothing, and textile industry.

### Biomimicry in clothing design

Reviewing inspiration sources in clothing design and biomimicry, it can be concluded that three levels of inspiration from nature exist in clothing design: material, form, and function (Chart 1). New achievements in materials which are used in clothes are of the influential factors in the design of clothing. In the meantime, the status of materials inspired by nature in the field of fabric is undeniable, and examples of it have been used from the past until now. For example, humans have used a combination of animal skins to protect themselves from the cold. Fishers have used natural functions of skin in their clothes so that with a mix of bird and seal skin, they have gotten waterproof and insulating clothing. Plants and animals have also been the source of inspiration in the production of materials such as cotton, silk, and wool (Kapsali & Dunamore, 2008, 118). In

<sup>4</sup> Biology Influencing Design, Bottom-Up Approach, Solution-Driven Biologically Inspired Design

<sup>5</sup> Lotus effect: the property that exists in lotus leaf was discovered in 1970 by a botanist at the University of Heidelberg. These surfaces are water-repellent surfaces that are referred to as hydrophobic properties. This property makes water forming small flakes that fall from the surface of leaves and takes all the pollutants deposited. Based on this characteristic and with the help of nano-technology, nano self-cleaning and easy-cleaning surfaces were invented.

<sup>6</sup> At this level, Ms. Benyus has only used the word form. However, among the instances and explanations in this phase, there are examples related to function too. Since there is a difference between concepts of form and function in design term for designers, for being more accurate convey of the sense that she has in her mind, the word function has also been added.

<sup>7</sup> Velcro or zipper Velcro is the hook brand and loop type of fastening hooks that invented by Swiss electrical engineer George de Mestral in 1948 and registered by him in 1955. The discovery is used in designing double-sided adhesives on bags and shoes.

recent decades, newer developments emerge; such as introduction of hydrophobic fabrics or textiles inspired from shark skin<sup>8</sup>, and fabrics with the ability to change color inspired from butterfly wings (Shimomura, 2010, 56-59) which led to considerable change and improvement in the clothing industry. Beside aesthetic and form aspects, clothes have functional aspects as well. Observing some of these aspects is of the basic principles in the design of functional clothing. Among the primary functions of clothes is response to physiological needs that fit the type of user activity and environment. For example, firefighters need to wear flame-resistant clothing, or residents in London and New York require proper clothes due to their places' features with frigid and short-term temperatures. Lightweight, portability, and durability of clothing are of other important factors (Kapsali & Dunamore, 2008, 122). Functional aspects of clothing have a smaller share in the use of biological mechanisms. Examples of it are inspired fabrics from Velcro plant or camouflage capabilities of creatures.

Finally, designing the form of the clothes deals with creative combining of color, texture, and volume and has the most influential role as the biggest source of inspiration from nature. Biomimicry as a source of inspiration in designing clothes' aesthetic forms could run at five ways and steps: 1) imitation of the living being's outlook, creation of the form and the appearance of the design, 2) imitation of the living being's textures, 3) imitation of the living being's colors, 4) imitation of the living being's patterns on the clothes, and 5) imitation of the living being's structure and proportions. (Chart 1)

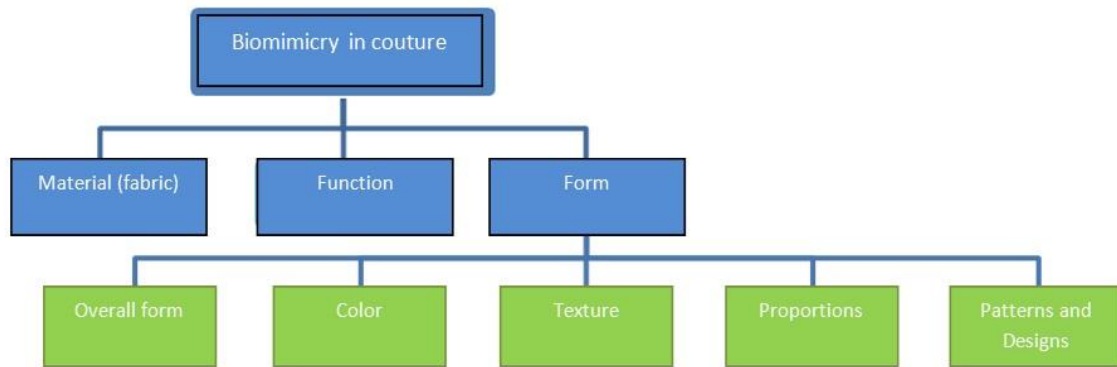


Chart 1: Biomimicry at different levels of Clothing design  
Sources: author

Each of these ways can be used separately or in combination with each other to design the final clothes (Figures 8 and 9), but typically, we face a combination of these factors because the final form of clothes is composed of all factors of form, color, texture, proportion and even the material.



Figure 8: Sample of texture inspiratory in fabrics and clothing. Left: Cloth inspired from the texture in moon. Source: [instagram.com/l\\_i\\_l\\_l\\_i\\_u\\_m](https://www.instagram.com/l_i_l_l_i_u_m)  
Right: The Inspiration from cabbage tissue eaten by snails Source: (Chen, Peng, 2015, 5)

<sup>8</sup> A type of Speedo swimming costumes was inspired by sharkskin that caused setting historical records for swimmers at the 2008 Olympics.



Figure 9: Inspired from crane color in clothing. Source: (Chen, Peng, 2015, 8)

### The procedure of clothing's form design based on biomimicry

Designing of clothes outlook and external form which is inspired from nature, can be done through two main approaches: iconography and emotional design. Each of these two approaches takes a different course (Chart 2 and 3). In iconography approach, natural patterns and forms emerge directly and objectively in clothes and the designers mimic exactly the natural forms to design. In this approach, the designer considers a natural sample usually chosen based on his personal intention and analyzes it at five aesthetic levels (outlook, color, texture, proportion and pattern) to reach to a prominent and interesting form patterns. The obtained aesthetic factors are combined in different styles and based on designer's creativity and finally the ultimate form of the cloth is created.

For example in this case, a kind of walrus is considered and the process of form analysis is done. (Figure 10) Prominent form factors including many and fluid fins, color, and striped texture with thin and thick lines are extracted and used in final cloth.



Chart 2: The process of designing clothes in iconographic approach. Source: author

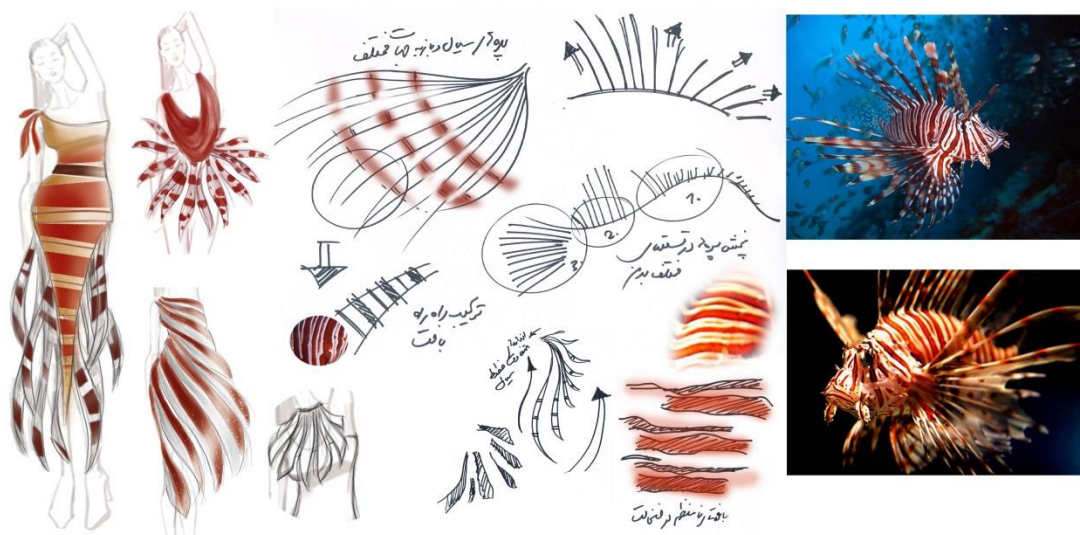


Figure 10: Designing Clothes by iconography approach. Source: author

People always have emotional reactions toward issues and events around them. Objects' form is for example one of the factors creating emotional impacts on the audiences and users. Accordingly, the second approach is based on expression of the emotions that humans get from natural forms. Although no form is without emotional impact, this goal is not considered as the main design factor, in the first approach. The second approach is aimed to achieve a certain emotional impact on users,

based on using natural forms. Therefore, in this approach, firstly it is determined the emotional components and the designers goals to express in clothes. Natural samples are selected and analyzed based on the expressiveness of the feelings. Thus, in this process more than one creature is considered and analyzed. Aesthetic analysis of natural samples is done, based on the detection of effective form factors which are responsible in expressing the desired emotions, at five levels (general form, color, texture, proportion and patterns). After deduction of form factors which are related to specialized emotions, the designer can use the obtained aesthetic rules under which he can begin designing. Implementation of volumetric and three-dimensional models of the designs helps a better understanding the forms provided (Figure 11). Therefore, the final design in this approach does not necessarily resemble a figure or creature in nature. For example in figure 10, achieving a sense of power and control, some cases in nature that seem to correspond to such a feeling in the users' mind were selected and then the formal factors which are responsible of creating the mentioned sense, were analyzed and identified through aesthetic analysis stage. Factors identified at this stage are used in designing clothes and final designs are again evaluated based on the audiences' ideas (Figure 12)

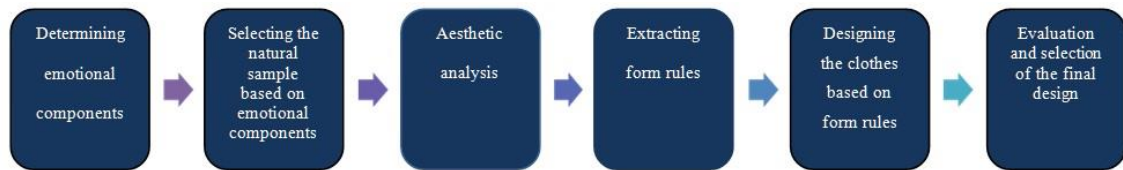


Chart 3: The process of designing clothes in emotional design approach. Source: author



Figure 11: volumetric clothes samples Source: author

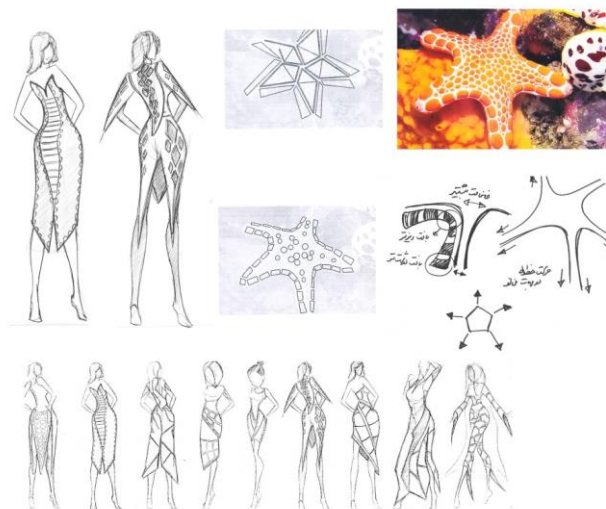


Figure 12: Samples of clothes design by emotional design approach. Source: author

## Results

Sources of inspiration have a special role in the process of creative clothing design. Various topics for inspiration both in within-domain and between-domain have attracted the attention of designers in the stage of theorizing and designing. Clothing design is mainly inspired from two main approaches of materials and forms and these two trends are two main sources of inspiration in designing clothes. Various fabrics with different tissue, patterns, and colors create a different starting point for the designers. In the area of form, among the most important sources of inspiration are similar clothes, historical and ethnic clothing, objects, artifacts, architecture, and nature. Using the different features of nature and its creatures has been considered in various scientific arenas such as engineering, materials, and design from the past. Today, the field of studying nature with the aim of solving the problems of human beings is called biomimicry that is a strong potential for innovation in various aspects of clothing design. It is concluded that biomimicry in designing clothes is discussed in three areas of form, function, and materials. Samples in the field of form and material have been much more than the ones in function. Since the form is composed of different visual elements, inspiration from the natural forms happens at five levels of general form, color, texture, proportion, and patterns. Each of these ways can be used separately or in combination with each other to design the final clothes. Finally, two main approaches in designing forms of clothes inspired from nature are introduced: iconography and emotional design. In iconography, the main goal is to resemble the patterns and forms exist on natural creatures. Nevertheless, in emotional design, the natural cases are selected, analyzed and used based on emotional effects of natural objects or phenomena on humans. Each of these two approaches is implemented through different methodologies.

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